

2000 Annual Report

THE NIST VISITING COMMITTEE ON ADVANCED TECHNOLOGY



U.S. DEPARTMENT OF COMMERCE
TECHNOLOGY ADMINISTRATION
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
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Preface

The Visiting Committee on Advanced Technology (VCAT) of the National Institute of Standards and Technology (NIST) was established in its present form by the Omnibus Trade and Competitiveness Act of 1988.

Each year, our Committee summarizes its findings in an annual report submitted to the Secretary of Commerce, for final transmittal to the Congress. The annual report addresses issues that affect NIST, its laboratories, programs, and facilities, or are of concern to the Committee in its role as NIST's private-sector policy advisor. This Fiscal Year 2000 annual report covers the December 1999 meeting through the September 2000 meeting.

In fulfilling its legislatively mandated advisory and oversight role, the VCAT complements the work of other NIST advisory groups, in particular, the National Research Council's Board on Assessment of NIST Programs, the Manufacturing Extension Partnership (MEP) National Advisory Board, and the Advanced Technology Program (ATP) Advisory Committee. The Committee studies the policies and processes employed by NIST management to optimize the overall effectiveness of the Institute's programs and the allocation of resources toward achieving the NIST mission. It also focuses on selected cross-cutting topics and special current issues. In past years, in addition to considering NIST-wide issues, the Committee heard in-depth presentations on individual projects selected from across the spectrum of NIST activities. At the beginning of FY 2000 the Committee decided that it could discharge its responsibilities more effectively by focusing in depth on two or three operating units at each meeting. This new approach is working well. All operating units were reviewed during FY 2000 with the exception of the Physics Laboratory, which will have an in-depth review at the December 2000 VCAT meeting. During 2001 we plan to do a number of "cross-cut reviews" of topics affecting multiple operating units.

Each year the Committee reviews reports from the National Research Council Board on Assessment of NIST Programs, which conducts comprehensive reviews of the quality of the NIST laboratory work. Reports from the MEP and ATP Advisory Committees are also studied. The wide range of experience of the VCAT members and the comprehensive review approach used enable assessment and recommendations across the full spectrum of NIST activities. At each of its four meetings during the year the Committee provides observations and recommendations to NIST. These frank exchanges include things the Committee believes are going well as well as areas where improvement is possible. NIST management is highly responsive to this constructive feedback.

This year I served as Chair of the VCAT and Caroline Kovac served as Vice-Chair. Two new members joined the Committee: Juan Sanchez and April Schweighart, bringing the Committee nearly to full strength.

This report focuses on findings and recommendations and does not provide detail concerning individual presentations. Copies of actual presentation materials from all of the speakers are available upon request from the VCAT office, and copies of minutes of recent VCAT meetings can be found on the VCAT website: <http://www.nist.gov/director/vcat/>

Thomas Manuel, Chair

2000 Visiting Committee Members



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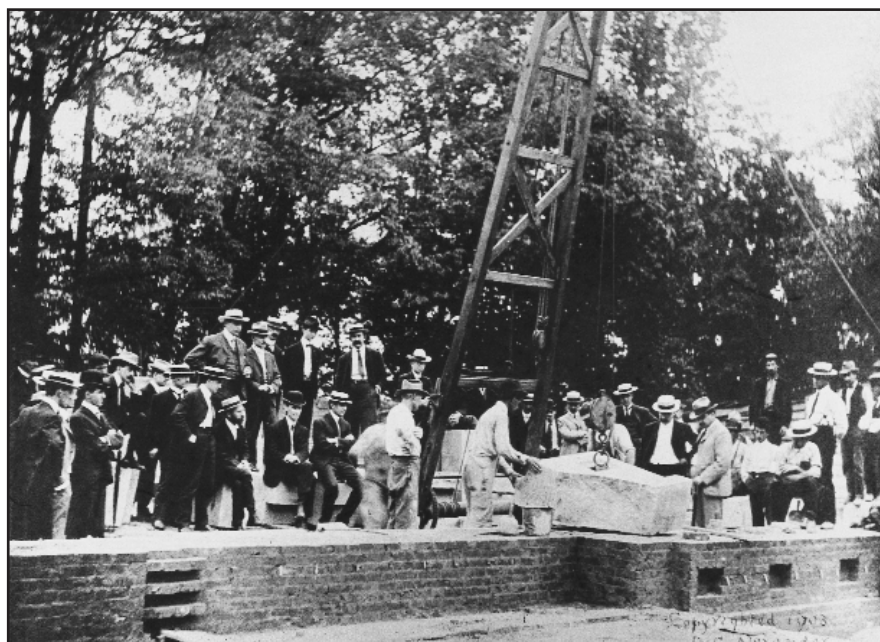
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I. Overview and Executive Summary

The Visiting Committee on Advanced Technology finds NIST to be a significant national asset, unquestionably the world's leading measurement and standards organization. NIST provides highly valuable services to U. S. business and industry by underpinning the measurement and standards infrastructure that is indispensable to maintaining and enhancing productivity and competitiveness, enabling international trade, and improving public health, safety and environmental quality. NIST enjoys an enviable reputation for scientific excellence, credibility and impartiality. NIST employees support an immense variety of technologies and industries through direct service at many points of contact with companies and through fundamental scientific research. NIST scientists and engineers are recognized worldwide for their impressive achievements in the science and technology underlying measurement. But NIST is much more than a measurement and standards organization. Its Manufacturing Extension Partnership, the Advanced Technology Program, and the Baldrige National Quality Program furnish key support to small companies, to the development and commercialization of new technologies, and to the quality-based competitiveness of all U.S. organizations.



The VCAT has pursued a few major themes in 2000: leveraging specific excellence through NIST-wide values, practices and programs, demonstrating value creation, working collaboratively across organizational and disciplinary boundaries, reinforcing linkages with industry, adapting to a changing environment, and continuous improvement. We strongly support NIST's leadership as they move toward a NIST that is more focused, more productive, more driven by external impact and leverage, and managed more tightly for maximizing results and employee satisfaction.

Of the findings and recommendations in this report, four are particularly important:

In 1903 the cornerstone was laid for the original NIST site in Washington, DC. Today the VCAT continues to assess the adequacy of NIST facilities. The new chemistry laboratory and the about-to-be constructed Advanced Measurement Laboratory in Gaithersburg will help NIST stay in the forefront of technology. But as noted in this report, the adequacy of facilities in Boulder is a growing concern of the Committee. (All photos in this VCAT Annual Report are taken from the NIST Centennial commemorative booklet NIST at 100 in honor of the Centennial.)

1. The Challenge of Responding to Rapid Change and New Technologies:

The greatest challenge for NIST today is responding to change in the technology and business environment. In the face of this challenge increased investment in NIST is highly recommended. Change is accelerating. Lead times are shrinking. Product cycles in industry are shorter today. New scientific disciplines and even new industries are developing more quickly than ever before. For example, in the past two or three years, combinatorial methods and DNA diagnostics have suddenly become "hot areas." Technology in the semiconductor and computer industries is evolving faster than even the most optimistic industry roadmaps had projected just a few years ago. Interest in the radically new research area of quantum computing is growing. NIST is expected to develop measurements and standards for these and other wholly new areas as well as traditional areas where there are continuing needs for NIST assistance.

NIST's resources have not been growing commensurately with the opportunities presented by new developments in science and technology. In this environment, NIST must be more selective than ever before in order to apply a critical mass to

fast-moving areas. Hard choices must be made about which technologies to emphasize and which to de-emphasize. NIST must align itself even more closely than in the past with industry in order to track these new developments and ensure that its priorities are consistent with national needs. At the same time, NIST must continue to pursue long-term projects in fundamental metrology that industry may not require in the short term, but that are essential to prepare for the future. An appropriate balance must be struck between addressing current industrial needs and laying the groundwork for the future. Ongoing and more frequent reassessment and rebalancing of NIST's "portfolio" of projects is essential to maximize NIST's impact in both the immediate future and the longer term. The VCAT strongly advocates increased investment in NIST for the benefit of the national economy.

2. The NIST Extramural Programs Continue to Benefit the United States:

The Committee believes that the Manufacturing Extension Partnership, the Baldrige National Quality Program, and the Advanced Technology Program are all well managed programs paying dividends to the country greatly in excess of their costs. All three advance

U.S. competitiveness, promote innovation, and should be continued.

3. NIST Capital Equipment and Facilities Need Upgrading:

Scientific problems are growing steadily more complex, and the equipment required to do leading edge research is correspondingly more complex and expensive. While skilled and dedicated professionals are the heart and soul of NIST, they must have adequate equipment and facilities if NIST is going to continue to serve American industry well. Equipment costs have been escalating faster than general inflation. Many pieces of modern equipment, such as semiconductor processing cluster tools or electron microscopes, cost well in excess of \$1 million each. NIST's equipment budget needs to grow faster than it has in recent years, and greater investment per knowledge worker is needed for maximum effectiveness.

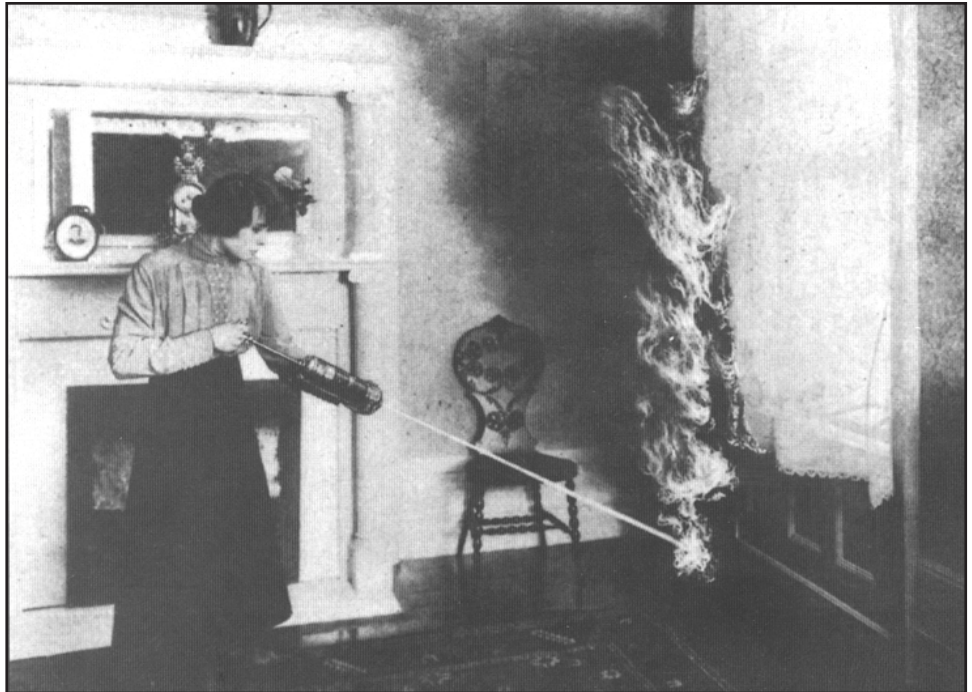
NIST's facilities are aging. The new Advanced Chemical Sciences Laboratory and the soon-to-be constructed Advanced Measurement Laboratory will certainly improve the situation in Gaithersburg dramatically. Although there are other continuing needs for building refurbishing in Gaithersburg, attention needs to shift to acute

facilities needs in Boulder. Despite yeoman efforts by NIST plant people, buildings continue to deteriorate. Sufficient funds to upgrade Boulder buildings are essential if NIST is to continue to fulfill its mission.

4. Interaction with Industry:

NIST devotes major attention to interacting with industry, identifying emerging needs, and disseminating results. However, the value contributed by NIST is difficult to aggregate and summarize, especially because of the diversity of its work. Consequently, it is too often under-appreciated by key decision-makers and influence centers in the industries it serves. We urge industry and government leaders to learn more about what NIST does and thus appreciate better its contributions to U.S. technological prowess and economic growth.

Principal findings and recommendations that support these major conclusions are discussed in more detail in Section II, and specific observations on particular operating units are summarized in Section III.



During the first few decades of the twentieth century, NIST produced a number of highly popular consumer information brochures.

This 1918 illustration demonstrates the proper way to use a fire extinguisher. The VCAT was recently briefed on NIST's highly sophisticated and impressive current fire research.

II. Findings and Recommendations

A. Summary of Key Points

1. NIST Director Kammer and Deputy Director Brown are to be commended for a number of positive management initiatives, including enhanced employee communication, leadership development, internal use of the Baldrige process, electronic interaction with customers, and international standards activities.
2. In general the individual programs within NIST's portfolio are well planned and executed. The quality of the scientific and technical work is high.
3. The demands and opportunities for NIST presented by the development of science, technology, and industry are growing rapidly. NIST's third party, neutral role is often critical in helping industry develop new standards and evaluation tools.
4. NIST operating units have had detailed strategic plans for years. A comprehensive NIST-wide Strategic Plan is needed to guide the overall response of NIST to future changes. We were pleased to learn that such a plan is under development.
5. Increased budgets are necessary if NIST is to maintain the present wide scope of programs in the light of new opportunities. Without additional funding, difficult priority decisions must be made, with the probable withdrawal of support from certain areas.
6. Although the VCAT is delighted by the construction and occupancy of the new Advanced Chemical Sciences Laboratory and the groundbreaking for the Advanced Measurement Laboratory, additional resources are still needed to maintain and replace aging NIST facilities, especially in Boulder.
7. NIST has excellent personnel, but we are concerned about maintaining that level of quality in the face of higher salaries and attractive opportunities in the private sector.
8. The Advanced Technology Program is well managed and is delivering measurable economic benefits to the Nation, consistent with its mission. It should be continued.
9. The Manufacturing Extension Partnership is generating high returns through its local centers and is moving into a new phase of increasing synergy among them and bringing the performance level of all the centers up to that of the best ones.
10. The Baldrige National Quality Program is well established as providing value to manufacturing and service industries, and increasingly to health and education. It should be extended to other major enterprises.
11. NIST needs to increase its efforts to work cooperatively with industry and to communicate its value to key stakeholders. Consideration should be given to finding a way to complement the Measurement and Standards Laboratories with a customer-driven focus on industries served. NIST's Office of Microelectronics Programs fulfills this role for the semiconductor industry. It is impractical to establish a special office for every conceivable industry since there are so many, but it could be helpful to have at least one designated individual who is responsible for being intimately familiar with all that is going on at NIST affecting a particular major industry and who maintains awareness of that industry's current measurement and standards needs across the board.
12. The flexibility and quick response needed to adapt to future change will call for more common NIST-wide processes and systems to facilitate prioritization and resource shifts. The historically based NIST organization of the measurement and standards laboratories into discipline-defined operating units and the fact that the NIST Congressional budget is broken down into rather fine-grained program elements complicates

rapid realignment of efforts. Director Kammer and Deputy Director Brown have had some success in changing the traditional NIST "stovepipe" organizational culture of past decades by encouraging work that cuts across operating units. Their approach is appropriate for the times and deserves buy-in from all NIST managers.

13. The technology and organizational leadership qualifications for NIST leaders are very demanding. An appropriate merit-based selection process for NIST leadership, with due consideration of internal and external candidates, must be maintained.

B. Organizational Development and Management Initiatives

NIST Director Kammer and Deputy Director Brown have taken a number of positive steps to make NIST a more effective organization and a better place to work.

- NIST is encouraging its operating units to apply the Baldrige principles to their internal operations. This is paying dividends. The Government Performance and Results Act requires agencies to engage in impact assessment, but NIST, to its credit, seems to be going considerably farther than the minimum required to satisfy that act, especially for its non-

laboratory extramural programs (MEP, ATP, and the National Quality Program). Some NIST managers are still emphasizing activities rather than outcomes in their impact assessment. Emphasizing outcomes is clearly the right approach.

- NIST is finding new opportunities to use the Internet to deliver services more effectively and increase convenience to its customers. Calibration service customers can now track the status of their calibrations on-line. The content of the NIST internal website continues to expand and improve and NIST continues to increase its use of web-based approaches to disseminating reference data. Routine tasks such as forms dissemination, registering for conferences and reserving conference rooms can be done on-line. NIST might use the Web even more extensively to alert people to technical areas where the NIST labs have an interest in working with



NIST's numerous contributions to electronics and military hardware began early. NIST work on radio direction finding (shown here) was important to defense technology. Work on proximity fuses during WW II helped to win the war, and led to the spinoff of what is today the Army Research Laboratory. The VCAT has seen numerous examples of today's contributions to electronics and defense technologies by NIST.

industry or are already working with industry.

- Director Kammer has launched a dialogue with the American National Standards Institute (ANSI) and the other players in the voluntary standards community in the United States, and with international organizations such as ISO (the International Standards Organization) and IEC (the International Electrotechnical Commission) to explore how the United States can be more effective in international standards development. Many in the United States believe that the way the international standards system currently operates creates a non-level playing field for American companies. For example, international standards committee meetings are frequently held in Europe, hence it is difficult for U.S. companies, especially small businesses, to be represented. ISO and IEC seem receptive to considering changes to the current international standards system. The key next step is to ensure that interested parties in our country develop a consensus position and present a united front internationally. NIST is striving to serve as a facilitator for this consensus development process rather than drive it. The issues are complex and include, for example, whether the present system of financing U.S.

standards development organizations is adequate for the 21st century. It is important that the next NIST Director continue these efforts.

C. Human Resource Issues

- NIST has an outstanding scientific staff, as their worldwide recognition within the scientific community attests. Despite lower salaries and more limited upward mobility than in the private sector, NIST continues to attract its share of the best and brightest young scientists. So far the opportunities for self-fulfillment in a NIST career have been attractive enough to overcome other limitations. However, retention is an increasing concern, given the temptations of the private sector. NIST leadership needs to pay continuing close attention to this area, and to increasing the job satisfaction of the staff. Additionally, career and management development programs begun by Director Kammer and Deputy Director Brown should be continued and emphasized. NIST should develop "specifications" for what it takes to be a successful OU Director, Division Chief, Group Leader, or Office Chief, identify promising candidates, and ensure that they receive the training and growth assignments they need to become outstanding future leaders for NIST.
- An extensive employee opinion survey was conducted in 1999 with a follow-up survey this year. Areas of high satisfaction have been identified, along with areas for improvement. Better communications were highlighted as a need. Plans have been formulated and actions initiated for responding to problem areas.
- Deputy Director Brown has held town meetings with employees in both Gaithersburg and Boulder to provide opportunities for dialogue on important issues, and has also held informal coffees with small groups of employees. The NIST internal website features a staff forum.
- NIST is piloting 360-degree feedback programs (in which peers and those supervised assess the individual, as well as the supervisor). This process is not currently being used to determine bonuses or performance rankings, but rather to help employees become more aware of their strengths and weaknesses. We encourage such experiments.
- NIST is committed to fostering diversity. All NIST supervisors are required to have diversity as a critical element in their performance plans. The Committee applauds this commitment.

D. Limited Funding Growth, Strategic Planning, and the Need for Prioritization

Advances in technology and the associated economic growth require increasingly complex and demanding measurement support. Although the rapid growth of the "new economy" presents increasing needs and opportunities for NIST, operating funding for the Measurement and Standards Laboratories has lagged inflation since 1997. NIST's stakeholders will benefit if NIST is enabled to continue ongoing services still needed by industry as well as to develop new services that reflect rapid changes in technology. The needs identified by the scientific community and industry are remarkably diverse and growing rapidly. NIST is reluctant to trade off continuing efforts against new opportunities. Where new needs can only be met by reducing previous commitments, some NIST groups have shrunk, experienced fiscal problems, and are nearing critical mass. The National Research Council Board on Assessment of NIST Programs has also called attention to this problem. In the absence of additional appropriated funds, the NIST operating units must focus more and be exceedingly rigorous about priorities.

NIST is engaged in "NIST 2010," a strategic planning exercise to examine how NIST must evolve

over the next decade to ensure appropriate alignment with the Nation's needs. This plan is essential to guide the necessary resource reallocations. Greater emphasis is needed across NIST on information gathering from industry and moving proactively to allocate resources.

Some NIST operating units have more robust techniques for projecting impacts and making difficult priority choices than others do. We foresee a need to make even more difficult choices in the coming years. The current prioritization systems operate within individual operating units, but a NIST-wide system is needed to permit reallocation between operating units.

We urge NIST leadership to continue driving for NIST-wide prioritization criteria and processes.

The VCAT believes that NIST could better meet its stakeholder expectations and respond to changing needs with a more flexible budget structure that facilitated reallocation of funds between line items.

E. Interface with Industry and Other Stakeholders

- Although this is already a high priority, NIST needs to put even more emphasis on its interface

with key stakeholders at higher levels in industry. All OUs actively seek input from and involvement with individual companies and with industry groups through direct contact and workshops. The OUs are also diligent in disseminating their results to a wide audience. There are many impressive, documented cases of value contributed by NIST to these "customers." However, this value is widely dispersed among hundreds of projects and companies, and the private sector individuals who are involved and aware of NIST's contributions are often not senior in their organizations.

- Tracking NIST activities by industry sector is a useful approach that should be more widely employed. A long-standing example of this is the Office of Microelectronics Programs, which interfaces with the semiconductor industry. For example, someone from the auto industry might like to find out what NIST does for that industry but probably would not know which particular NIST operating units to contact or where to go in NIST's website in order to get an overview of that particular industry. (We understand that NIST has recently taken steps to help address this need.) NIST's discipline-defined internal organizational scheme is of little



By the 1920s NIST had unique facilities and had developed world-class expertise in casting large precision optical glass objects such as this telescope mirror. This year the VCAT carried out an in-depth review of the NIST Materials Science and Technology Laboratory. Ceramics, metals, polymers, and materials reliability are key areas today.

interest to most customers. Categorizing NIST's efforts by industry sector makes it easier to appreciate the contributions of NIST to a given sector. This might also gain stronger outside support for NIST from these constituencies.

- NIST tends to be modest about its accomplishments and probably should devote even more effort to publicizing its contributions to higher-level industry leaders. While technical peers in industrial companies are often aware of NIST's contributions, it is important that senior corporate managers at and near the CEO level also hear about NIST's contributions. Additional opportunities should be sought to make NIST's value proposition

clear to groups such as the Council on Competitiveness, the Council for Chemical Research, and a variety of other industrial trade associations. Additional "marketing" to other Federal agencies might also increase awareness of NIST's contributions. We understand and applaud that NIST has recently expanded its focus on association and agency outreach and liaison.

F. Coordination with the National Research Council Board on Assessment of NIST Programs

The National Research Council Board on Assessment of NIST Programs (BOA) is responsible for reviewing the quality of NIST laboratory work. While this responsibility is different from that of the VCAT, it is obviously important that the two bodies cooperate and share information. We welcome attendance by BOA representatives at our meetings and encourage VCAT representation at BOA meetings. The VCAT chair attended the spring meeting of the lab directors with the BOA.

The Chair of the BOA, Dr. Linda Capuano, presented a report on the findings and views of the BOA at the September VCAT meeting. Ross Corotis of the University of Colorado, a member of the BOA, also attended the September meeting, as did Dorothy Zolanz of the National Research Council, which operates the BOA for NIST.

Dr. Capuano described the organization and operations of the BOA and its recent findings. The BOA conducts detailed reviews in each of the laboratory operating units, using expert peer-group panels. Highlights of the findings are:

- The overall technical merit of NIST's work is high.
- Relevance to mission is good.
- Criteria are in place in each lab for project selection and continuation.
- Standards and data services continue to address needs.
- The new Advanced Chemical Sciences Laboratory has relieved facilities inadequacies in the chemistry area. The Advanced Measurement Laboratory will help in other areas. But there remain serious facilities inadequacies, particularly in Boulder.

The Board has several concerns:

- Budget increases since 1995 have generally been more than offset by inflation and mandatory salary increases.
- Some programs are near critical

levels due to resource constraints (examples: materials reliability, some microwave calibrations, and wind engineering).

- NIST's response is usually to seek other-agency funds to make up the shortfall, but this takes up researchers' time and NIST loses control over program direction.
- A long-term plan for capital equipment is needed.
- Budget constraints can adversely affect recruiting and retention.
- Rapid change puts NIST under pressure, and globalization causes NIST's role to evolve.

The Board would like to see a strategic plan for NIST's Measurement and Standards Laboratories as a whole, to facilitate making difficult choices and create a unified strategy.

Dr. Capuano stated that the BOA feels that NIST's laboratory work is good and getting better, but the Board does have serious concerns as noted above.

The Board has concerns that often parallel those of the VCAT. Both the BOA and the VCAT are concerned about the lack of facilities funds to renovate buildings that are in need of it. We hope the Administration and Congress will recognize these growing needs and respond accordingly.

Dr. Capuano commented that in the past, NIST people had considerable freedom to pursue their own

interests as long as they related to the NIST mission. Today with resources so scarce, there must be more focusing. The worst thing that NIST might do would be to make repeated across-the-board cuts that would hurt all programs. Increasingly NIST people are using up large amounts of time to write proposals to other Federal agencies in order to make the payroll. In some groups, people spend 30% of their time proposal writing, and this is not a good use of time for these talented people. We concur.

G. Advanced Technology Program (ATP) (Additional information on ATP can be found in Section III-L.)

Contrary to some allegations, ATP is a well-managed, fair program that is providing measurable economic benefits to the Nation—benefits well in excess of its costs. We have been impressed by the thoroughness and sophistication of the impact assessment carried out by ATP. This degree of data gathering and analysis is unique and deserving of emulation by others. The ATP has gathered sufficient data now to show that the program is accomplishing its goals, and should, therefore, no longer be looked upon as an experimental or questionable program, but rather as one that has demonstrated its worth. Studies have projected that just three of the ATP's early projects have

generated economic benefits to the United States in excess of the entire cost of the ATP to date. Certainly, it should be continued. ATP needs to continue to strive to achieve bipartisan support for what appears to us to be a highly successful program.

Based on the evidence we have seen, we are convinced that ATP treats its applicants fairly and that selections are made objectively per the published criteria.

The VCAT chair attended the October meeting of the ATP advisory committee. We anticipate that the ATP Advisory Committee will, in its annual report, make a number of recommendations deserving of careful consideration by policymakers. Among them we expect a recommendation to increase the cap on ATP funding to a single applicant. This figure was capped at \$2 million without inflation indexing when the ATP legislation was crafted in the 1980s. We recommend that new authorizing legislation increase this figure and that it be indexed to inflation in the future.

The National Research Council is developing a comprehensive Congressionally mandated report on ATP. This report deserves high-level attention.

H. Manufacturing Extension Partnership (MEP)

(Additional information on

MEP can be found in Section III-K.)

The Manufacturing Extension Partnership (MEP) has built a network of centers in cooperation with State and local agencies that has accomplished much to improve the productivity of small manufacturers throughout the country. This program has demonstrated its usefulness to the Nation and has been shown to be a good investment. A clearly articulated business model for the MEP's operations and value contribution has been developed.

During its first few years of operation, attention was focused on increasing the number of centers to serve all parts of the United States. This has given way to the current phase in which attention is concentrated on bringing all centers up to the high performance standards of the best. Capturing and disseminating best practices is one of many ways that MEP accomplishes its mission.

MEP's headquarters staff at NIST play a key role by collecting and disseminating best practices and by objectively evaluating the operations of ongoing centers. Capitalizing on opportunities for achieving more synergy in the MEP system as a whole is a main theme for the coming years. In some cases, State funding has been unreliable. We urge State governments to maintain their fiscal commitments to the MEP centers.

The challenge for MEP is to find ways of achieving more leverage and scalability without substantial increases in resources. MEP developed an excellent self-help package for companies to evaluate their Y2K computer problems. This highly successful accomplishment can serve as a model for other analogous modules that companies can use to solve problems.

I. The Baldrige National Quality Program (Additional information on this program can be found in Section III-J.)

This program continues to perform a valuable service to the Nation, not only in its original industrial arena but also increasingly in health, education, and other enterprises. We encourage its growth in all areas. The fact that States and foreign nations have copied it is a tribute to its vision and effectiveness. We find nothing to criticize and much to praise.

J. Additional Comments

The VCAT believes that NIST could play a central role among Federal agencies in the field of computer security. This is an important national issue.

Frequently NIST has kept a low profile relative to some other Federal agencies. We recommend that in future budget initiatives, NIST put more emphasis on clear deliverables, the potential impact of proposed new NIST programs,

and the unique role of NIST. The VCAT believes that because NIST is a technical organization, NIST tends to focus on the technical aspects of its work and not enough on the potential impact of its proposed new initiatives. Science and technology are increasingly conducted by cross-discipline, cross-organization teams. NIST needs to organize more of its portfolio in this manner.

Overall, the VCAT believes that NIST is making continuous improvements and continues to produce impressive results. The modest cost of NIST compared to many other science and technology agencies of the Federal Government is an excellent investment for the taxpayers.

III. Highlights from Operating Unit Reviews

A. MANUFACTURING ENGINEERING LABORATORY (MEL)

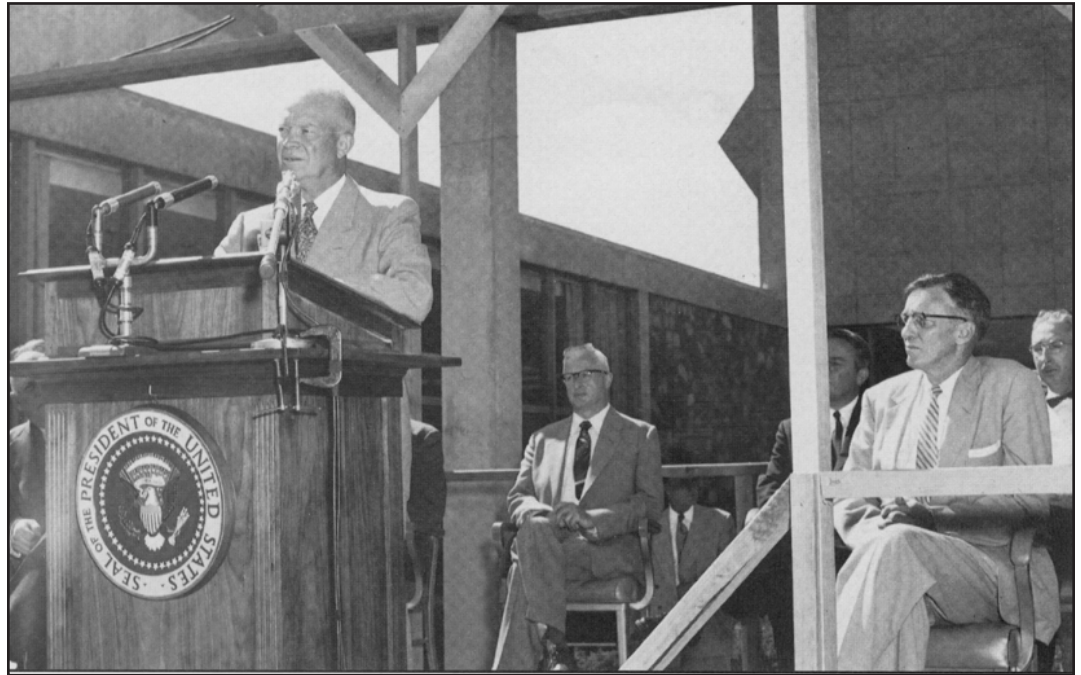
(Dr. Richard Jackson, Director of MEL at the time, gave the presentation.)

• Mission and Industries Served

MEL provides the physical and informational measurements and standards needed by the discrete parts manufacturing industries, from front office to factory floor. Examples include length, mass, force, acceleration, density, and measurements for ultrasonics and acoustics. The Laboratory's vision statement reads: "MEL is the premier national resource for rapid, high-quality solutions to measurements and standards problems in the U.S. discrete parts manufacturing industry's use of leading edge technology."

• Priority Setting

MEL holds frequent workshops in topical areas with industry technical leaders invited. MEL is also involved in industry roadmap development committees. In addition, MEL staff visit individual companies and speak to industry people at technical conferences and standards committee meetings. Based on this input, MEL management sets program priorities. For



this laboratory, as for all NIST labs, we feel that potential for high impact is an overriding criterion for choosing programs.

• Impact

The Laboratory measures its impact and effectiveness through:

- ◆ Benchmarking vs. counterpart laboratories
- ◆ Soliciting feedback from customers of calibration services and other outputs
- ◆ In-depth economic impact studies of particular projects
- ◆ Feedback from MEL's Assessment Panel

There is a role for NIST in interoperability in this industry.

NIST's facilities expanded in 1954 when President Eisenhower dedicated the new Boulder laboratories. Today one of the concerns of the Committee is that these Boulder facilities are showing their age. In some cases facilities deterioration is interfering with NIST's work.

Companies often prefer de facto proprietary standards if they can achieve a high market share, because this can shut out competitors. But, when a company cannot achieve a proprietary standard, which is often the case, then companies prefer open standards so everyone can compete. The Internet has been successful because it is based on open standards. MEL selects those areas where industry welcomes its involvement and where NIST can make a significant difference by promoting technically sound open standards. We agree with this strategy.

• **Program Highlights**

Strategic programs in MEL are long term with well-defined goals and objectives. New MEL strategic program starts include:

1. Shop Floor as a National Measurement Institute.
2. Predictive Process Engineering.
3. Meso/Micro/Nanomanufacturing.

• **Human Resources**

The average age of MEL staff is about 50, with many people approaching retirement eligibility. MEL has lost most of its programmers to much higher paying jobs in industry. While most people hired by NIST find the work interesting and rewarding, and tend to stay for a whole career, MEL definitely will need to recruit and

retain a considerable number of new employees in the next decade in a job market likely to be extremely competitive. Success will require creativity and hard work.

B. Materials Science and Engineering Laboratory

(MSEL) (Dr. Leslie Smith, Director of MSEL, gave the presentation.)

• **Mission and Industries Served**

MSEL promotes U.S. economic growth by working with industry to develop and use measurements and standards infrastructure for materials. Industry service programs include metals processing, polymer blends and processing, polymer composites, ceramic manufacturing, ceramic coatings, electronic packaging, magnetic materials, and dental and medical materials. MSEL's measurement service programs include phase equilibria, metals data and characterization, polymer characterization, failure of brittle materials, thin film measurements, ultrasonic characterization, synchrotron X-ray beam lines, and neutron characterization. Unlike many industrial and other government labs, MSEL does not seek to develop new materials. MSEL provides infrastructure tools such as measurement methods and materials data that other labs need to carry out their materials

research and development more efficiently.

• **Priority Setting**

MSEL holds frequent workshops on topics of current interest, and these provide opportunities to understand industry needs. MSEL staff also meet with large and small individual companies to better understand emerging industrial needs. In light of globalization, industry is increasingly using international standards rather than domestic standards. In response, MSEL is devoting proportionately less effort to domestic standards activities and more to international standards activities. The Committee concurs that increased attention to international standards is appropriate.

Electronics and communications, information technology, and health care are three areas that seem particularly important for economic growth, and so MSEL has given these a high priority. The environment is also a high priority area. NIST has carried out projects that relate to environmental concerns (e.g., lead-free solder), but the other areas noted above seem to present an even greater opportunity for MSEL.

Dr. Smith stated that MSEL reprograms roughly 20 % of its activities each year. This is a reasonable level.

- **Impact**

We liked the list of questions that MSEL uses for impact assessment. In some cases, impact can be quantified. For example, if MSEL's work with industry on joint replacement leads to significant increases in the time interval between joint replacements, these data, and the resulting decrease in medical costs, can be tracked as a function of time. Of course, observing such effects requires monitoring for long periods of time.

Companies today frequently have fewer technical experts on staff than years ago. Consequently, more training in applying data, services, and knowledge provided by NIST may be necessary. When there has been a "market failure," that is, where it is clear that training is needed for industry to apply new knowledge from NIST, then NIST has an obligation to provide it. In many cases, Internet-based training can provide a viable way to accomplish this.

- **Program Highlights**

An example of industry involvement is a consortium formed of orthopedics companies involved in joint replacement. The consortium funds postdoctoral personnel at NIST to develop knowledge needed by all the consortium members, for example, accelerated wear test methods. MSEL's

unique cold neutron facility is a national facility. Researchers from a wide variety of institutions queue up to use it.

- **Issues and Challenges**

One of the challenges for MSEL is to be sufficiently fleet of foot to keep up with small entrepreneurial firms working in advanced technology areas where the technology changes very rapidly. MSEL must identify opportunities and needs and be prepared to respond fast. Smith cited tissue engineering, a field where there is a growing need for measurements and standards, as a new field for which MSEL is considering its possible role.

- **Laboratory Tour**

Dr. Eric Amis, Chief of the Polymers Division, showed us the Polymers Division laboratory where MSEL develops combinatorial methods for materials science. While this field of research has been around for some time, it is only fairly recently that rapid progress and considerable success has been achieved in applying it to actual materials science problems. Most other researchers are using these techniques to discover or optimize new materials. NIST is using these techniques to explore parameter spaces to generate needed data, support modeling, and increase understanding of materials behavior.

The work we saw on this lab tour is in the mainstream of NIST's mission. The significance of the work to materials science was readily apparent.

C. Building and Fire Research Laboratory (BFRL) (Dr. Jack Snell, Director of BFRL, gave the presentation.)

- **Mission and Industries Served**

The Laboratory's mission is to meet the ongoing measurement and standards infrastructure needs of the building and fire safety communities. Building construction and operation and fire safety represent an important share of the U.S. economy, hence BFRL's work is economically significant. BFRL is a unique laboratory. Having access to the scientific resources of NIST is an important factor in BFRL's being able to stay at the cutting edge of its technology.

We feel that NIST's catalyst role in bringing diverse parts of industry together is extremely important and probably not sufficiently well appreciated. BFRL needs to step up efforts to show decision-makers how important its goals are and to explain clearly the shortfalls between what needs to be done and what can be done with current resources. We agreed that the kind of work BFRL does is clearly in the mainstream of NIST's mission.

• **Priority Setting**

The Laboratory was faced with a reduction in force this year. BFRL responded by conscientious priority setting and focusing the Lab's efforts more sharply on a smaller number of programs. Through Baldrige self-assessment and with other tools, BFRL is finding ways to accomplish more with fewer people.

The Committee was pleased with the BFRL presentation and felt that progress had been made on focusing the laboratory's efforts since the discussion of priority setting by BFRL at the March 1999 VCAT meeting.

• **Impact**

Fire safety engineering is becoming a more widely recognized discipline. More information is available to the community than ever before, with much of it NIST work or progress based on NIST work. NIST provides important data needed by the communities it serves.

BFRL serves large industry segments characterized by considerable inertia for change, hence BFRL cannot expect to cause radical changes overnight. It is important to identify an industry segment where NIST can have a large impact in the short run, and having achieved success there, expand into other areas. For example, perhaps some of the new

techniques NIST is researching can first be applied to construction in, say, the chemical industry, and after the value of the techniques have been demonstrated there, extend them to home construction which is more difficult to impact.

• **Program Highlights**

BFRL has been strengthening its ties with ATP and MEP. The Laboratory has also been engaged in discussions with FEMA (the Federal Emergency Management Agency). FEMA does not have a research lab of its own, and BFRL might be able to fulfill that role.

• **Issues and Challenges**

The most important issues for BFRL are:

- ◆ BFRL may not be close enough to its customers.
- ◆ BFRL may be spread too thin—doing too many things.
- ◆ BFRL lacks sufficient external advocacy.
- ◆ BFRL has not adequately captured and quantified the impact of its contributions. (This is a concern throughout the NIST labs.)

• **Laboratory Tour**

We toured the BFRL laboratory where research on cybernetic building systems is underway. BFRL is working with industry to explore the integration of all building control systems, including climate controls, environmental

monitoring, utilities, fire protection, etc., and the integration of multiple building control systems into a common central system. There are now about 10,000 systems in place utilizing the technology developed by industry with NIST's help. The building computer models developed in BFRL can allow companies to answer important economic questions such as how much better a building might operate with an improved air handling system, thereby helping companies decide whether or not a system upgrade can be justified.

D. Information Technology Laboratory (ITL) (Dr. William Mehuron, ITL Director, gave the presentation.)

• **Mission and Industries Served**

ITL's mission is to strengthen the U.S. economy and improve the quality of life by working with industry to develop and apply technology, measurements, and standards. ITL carries out research in IT measurements and standards to support the IT development industry as well as users in industry, Government, and the general public. The Laboratory also provides services in mathematics and statistics.

• **Priority Setting**

Information technology is moving faster than almost any other area of technology, and keeping abreast or ahead of these rapid changes is

truly a challenge. ITL has good relationships with the major companies in the field and participates in a variety of industry consortia. Interactions with industry include casual informal discussion of technical problems, formal Cooperative Research and Development Agreements (CRADAs), and various consortia arrangements.

The demand for NIST overhead services is growing fast in ITL. The need for more web-based services as NIST moves towards "E-NIST" is a principal reason. ITL has the expertise.

• **Impact**

We think ITL's work on conformance testing for XML through the OASIS Consortium is a good example of work that has had significant impact on industry. Another good example is ITL's work on smart cards, which is helping the finance and health care industries.

Advanced encryption and XML are two areas of particularly high impact for ITL.

• **Human Resources**

The demand for IT professionals is currently at an all-time high. ITL is scrambling to offer competitive opportunities to top-notch people. One strategy that seems to be working is to bring in students at an early age. They find they really

like working at NIST and are often inclined to stay even though they might get better salary offers elsewhere.

One of our members expressed concern about there not being more young people in ITL since IT elsewhere seems to be a field populated largely by "20-somethings," but another member noted the fact that industry is luring away some of ITL's senior people, which suggests that they must continue to be productive. Mehuron commented that ITL has been successful in finding high school and college summer students and co-ops eager to work at NIST. When their numbers are added to the permanent staff, ITL's staff age profile does include a substantial number of younger workers. ITL might use a strategy of bringing in people with the expectation that they might only stay in ITL for two to three years rather than for a whole career. Mehuron noted that NASA Ames operates this way and that ITL is willing to consider a mix of strategies. A member pointed out that if people rotate through it is difficult to preserve any corporate memory.

ITL has encouraged people who have been hired at lower levels to upgrade their education and compete for higher-level jobs. Quite a few people have obtained college degrees and advanced degrees while working at NIST. For NIST to compete with private

sector firms whose salaries may be higher, offering better training opportunities can be a good selling point.

• **Issues and Challenges**

We feel that with the explosion in IT usage in industry, ITL's STRS research budget should be growing appreciably.

• **Laboratory Tour**

ITL provided three lab tours:

1. "Smart cards" and biometric authentication technology. (Biometrics refers to identification technology to recognize an individual's fingerprint, hand, face, or other physical characteristic.)
2. Middleware for digital television.
3. Three-dimensional visualization of concrete rheology (a joint effort between the Building and Fire Research Laboratory and ITL).

E. Electronics and Electrical Engineering Laboratory (EEEL)

(Dr. William Anderson, Acting EEEL Director, gave the presentation.)

• **Mission and Industries Served**

EEEL's mission is to promote U.S. economic growth by providing measurement capability of high impact focused primarily on the critical needs of the U.S. electronics and electrical industries, and the customers and suppliers.

Maintaining and improving standards for fundamental electrical metrology is the core of the laboratory and is, therefore, essential.

• **Priority Setting**

EEEL identifies industries that need improved standards, and right now optoelectronics is one such industry. It is growing very rapidly and has numerous metrology challenges. Therefore it is a high priority. The Optoelectronics Division is the newest division within EEEL. It is difficult to keep good people in that area because there is so much demand from industry.

EEEL is exploring cooperative projects with other laboratories and assessing needs for systems on a chip. Another promising new area is MEMs (micro-electro-mechanical devices). EEEL currently has about three people working on MEMs and is exploring with the Chemical Science and Technology Laboratory needs for MEMs in areas like microfluidics.

Deregulation of the power industry is taking place, and this may increase needs for accuracy in electrical metering. NIST has done economic studies of the watt-hour meter calibration service. This is a critical area for the economy because of the billions of dollars involved. With increasing-

ly dispersed generation sources there will likely be issues between buyers and sellers of electrical energy and the companies that distribute it.

The explosion in wireless technology is creating technical problems, some of which may be measurement- and standards-related. There are issues of competing system standards in the United States that NIST cannot resolve. EEEL is watching this area closely to see how its role might evolve. (Of course NIST's current programs in radio frequency metrology serve this industry.)

• **Program Highlights**

The Committee was truly impressed with the N-WEST consortium approach described in Boulder two years ago. The champion for this consortium, Roger Marks, will come to Gaithersburg to describe this project so that others may understand how it worked, and might seek similar opportunities.

• **Issues and Challenges**

Globalization raises new issues for NIST. Many of NIST's services are available to anyone in the world, for example, calibration services, standard reference materials, and NIST publications. However, when NIST signs CRADAs with companies, the issue of whether that particular

collaboration is in the best interests of the United States must be addressed, and so, ownership of the company is an issue. (NIST Director Kammer commented that this is a tough issue throughout the Federal Government and that there are no simple guidelines currently available government-wide.)

EEEL has been de-emphasizing patenting inventions in recent years. While EEEL and other NIST labs continue to think about what might be an optimal intellectual property policy, this concern has not prevented EEEL from working closely with industry through CRADAs.

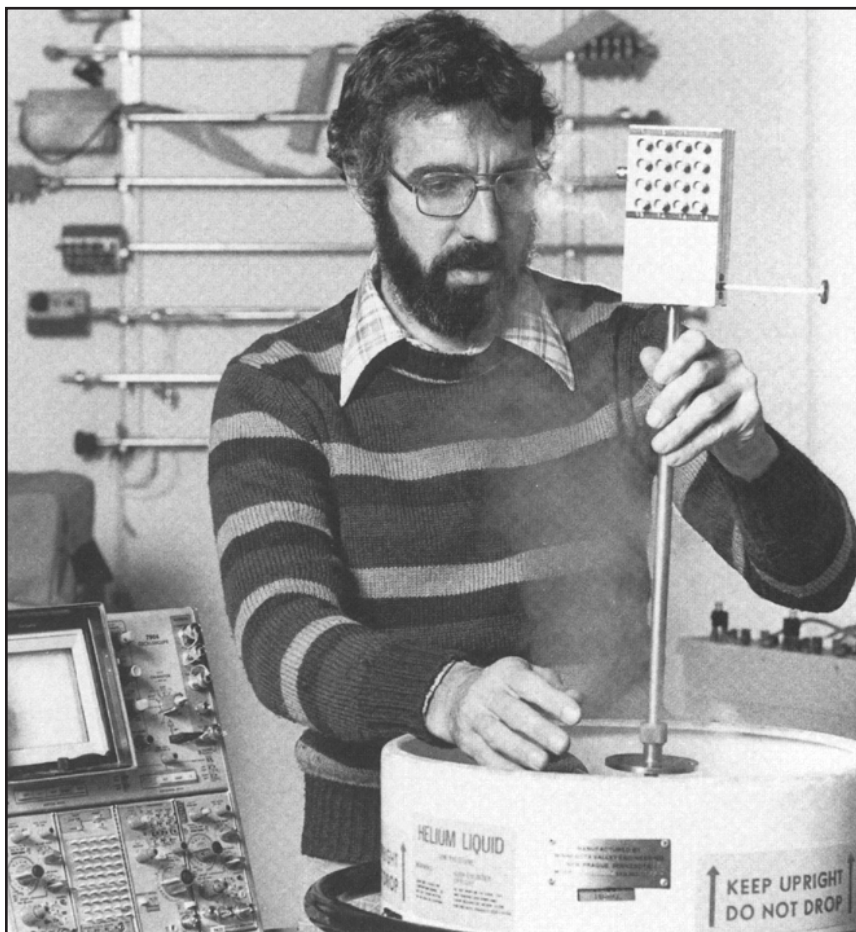
F. Chemical Science and Technology Laboratory (CSTL)

(Dr. Hratch Semerjian, CSTL Director, gave the presentation.)

• **Mission and Industries Served**

CSTL serves a wide variety of industries, including bulk and fine chemicals, oil and gas, biotechnology, pharmaceuticals, environmental remediation, and any other industry where process variables (for example, temperature, pressure, flow, and composition) are measured.

CSTL's programs cover a remarkably wide variety of topics. As with other NIST operating units, we wonder whether CSTL is spread too thin trying to cover so many different technical areas and



Fundamental standards of measurement are at the heart of NIST's mission. During the 1970s and 80s, NIST perfected a new and much better way to realize the volt and make precision voltage measurements based on superconducting Josephson junctions. Industry continues to rely on NIST for electrical measurements and standards. The VCAT sees this as an essential task for NIST.

whether aggregation at a higher level is appropriate. Semerjian noted that in recent years CSTL has worked to reduce the number of areas. There is a loyal customer base for each of the technical areas that CSTL currently supports. To the extent that resources permit, NIST has an obligation to serve all of American industry that wants or needs NIST help, and CSTL tries to respond to these needs. CSTL strives to focus on the areas where NIST has a unique role and where the impact of NIST's work is highest.

• **Priority Setting**

CSTL's criteria for project selection are essentially the same as those used elsewhere in NIST; for example, is the work compatible with NIST's mission? Does CSTL have a unique role to play? Is there critical mass for making a difference? Can NIST respond in a timely way and not miss the window of opportunity?

CSTL reprograms about 5 % of its work each year, or about \$1 Million to \$1.5 Million. The Biotechnology Division is the part of CSTL that is growing. The other divisions are flat. One concern is that the Biotechnology Division has a significant component of ATP funds, which may not be stable from year to year.

NIST has a variety of ways to respond to industry needs where resources are scarce. Sometimes guest workers can supplement NIST staff. For example, the College of American Pathologists has hired people to work in CSTL to accelerate work in which they have a special interest.

About 20 % of CSTL's effort goes into maintaining the infrastructure, with the remainder devoted to developing new capabilities.

• **Impact**

Dr. Semerjian gave examples of two areas of CSTL activities that have had important impact in

recent years. When the United States decided to phase out CFCs for air conditioning and refrigeration, NIST was able to provide extensive properties data on alternatives to CFCs, and this information was extremely valuable to industry in making the transition to the new refrigerants. Another important area is DNA forensics. The FBI now requires that DNA forensics labs be traceable to NIST.

The Committee commented that rather than rely on economic impact studies as the rationale for NIST involvement, it may be more effective to collect good anecdotes understandable to the general public about how NIST has helped due to its objectivity and neutral third party role. For example, describing how cholesterol tests were notoriously unreliable in the past, but how NIST standards are now helping to achieve better quality control for such tests is an example of an important story that the general public and Congress can readily grasp. Publishing a book of descriptions of how NIST has helped to solve problems such as that one could be effective.

G. Physics Laboratory

The Physics Laboratory will be reviewed in December 2000.

During the September meeting in Boulder, the Committee was treated to a tour of two laborato-

ries at JILA, formerly the Joint Institute of Laboratory Astrophysics, a shared facility of NIST (the Physics Laboratory) and the University of Colorado. Deborah Jin described her work on ultracold fermionic atoms, and Jun Ye described his work on laser spectroscopy.

H. Technology Services (TS) (Dr. Richard Kayser, TS Director, gave the presentation.)

• Mission and Industries Served

TS provides the customer interface for services such as calibration services, Standard Reference Materials, and standard reference data. It also has responsibility for the Office of Information Services (the NIST Library and related services), voluntary standards, laboratory accreditation, the metric program, patents, CRADAs, and the SBIR Program at NIST (Small Business Innovation Research). It provides services to essentially all of the industrial sectors that NIST supports.

• Program Highlights

Almost all labs accredited by NIST are in the United States. Most other developed countries have laboratory accreditation programs of their own.

NIST has guidelines for deciding what to patent. To justify applying for a patent, NIST has to be convinced that patenting will

enhance the chances of the invention being used commercially. Sometimes it is better to put the information in the public domain. This is a judgment call in each case. The Committee will be reviewing NIST patent policy in more depth at a future meeting.

• Issues and Challenges

NIST cannot make a profit on services such as calibration services—only recover costs. In addition to the cost recovery by the Division providing the service, there is a surcharge on each service to cover TS' costs, such as the cost of preparing the catalog of available services, and a second surcharge to improve existing services or develop new services. NIST is not required to recover costs for standard reference data, and increasingly NIST is providing data on the Web at no charge. Also, NIST does not recover the cost of the weights and measures program, which is considered a core function of NIST.

The Committee noted that the number of CRADAs per year seems to be dropping. Kayser noted that some years ago NIST tended to overuse CRADAs—employing them where they were not necessary. Today NIST is more selective.

I. Administration (Admin) (Mr. Jorge Urrutia, NIST's Director for Administration and Chief

Financial Officer, gave the presentation.)

- **Mission**

Admin is responsible for a wide variety of administrative functions: public and business affairs, plant, facilities construction and maintenance, budget and finance, human resources, occupational health and safety, grants and procurement, and a few other management functions.

- **Impact**

Urrutia spoke with pride about the accomplishments of the people in Admin, noting that NIST's electric bill has been reduced by more than \$0.5 Million per year due to equipment upgrades, that the recently built Advanced Chemical Systems Laboratory was constructed on time and within budget, and that NIST has had no major outages of services such as chilled water in 40 years of operation. NIST's nuclear reactor has regularly received a clean bill of health from the Nuclear Regulatory Commission. As recently as 1990, NIST was the only bureau in the Department of Commerce that had sufficiently comprehensive accounting records so as to permit a complete audit. Since then NIST has been asked to provide financial services to a number of other parts of DoC, and this year the Commerce

Department was listed as one of only a handful of Cabinet departments with sound financial management.

- **Program Highlights**

NIST spends approximately 6.3 % of its obligations on administrative overhead functions, which compares favorably with other similar organizations.

Admin has used the Baldrige approach for self-assessment and strives for continuing improvement. A contract with a consulting firm has helped Admin do benchmarking. NIST learned that its cost per square foot of cleaning the facility is favorable when compared to comparable facilities; however, NIST's utility costs are still somewhat higher than comparable facilities, and NIST is seeking additional ways to reduce these costs.

- **Issues and Challenges**

Funds available for maintenance and upgrades to NIST's aging buildings appear low compared to other places, and this is a concern. (See also item D in section II.)

In addition to benchmarking NIST relative to other Federal facilities, it would be good to do benchmarking to compare to private sector facilities. Committee members offered to help NIST locate data.

J. Baldrige National Quality Program (NQP).

(Dr. Harry Hertz, Director of the National Quality Program, gave the presentation.)

- **Priority Setting**

Continuing the expansion into health care and education is an important current thrust. The Program is hoping to achieve more national exposure in the educational community through vehicles such as the satellite broadcasts to schools.

- **Program Highlights**

Dr. Hertz showed excerpts from a video of a recent national conference, which illustrated the enthusiasm for applying the Baldrige criteria to education.

This is a unique program that has accomplished much during its first decade. Like the other extramural programs, the NQP engages in self-assessment. Each year the Board of Examiners critiques the selection process and recommends ways to further improve it. The Board of Overseers meets with the Program three times a year to review and assess progress and suggest improvements. Both are appointed by the Secretary of Commerce.

- **Issues and Challenges**

Balancing work life and home life

is an important issue both for the companies that apply for the award as well as the Program itself. Category 5 of the criteria deals with human resource focus (employee satisfaction and well-being is one aspect). Dr. Hertz is concerned about the high workload of his own staff, and in the office's internal operations, and is looking for ways to reduce the workload. For example, the Program is considering whether the eligibility determination can be eliminated by having applicants self-certify that they qualify for their category of application. We are pleased that the Program is seeking ways to improve its own operations.

As noted in the Executive Summary, we are very impressed with this program.

K. Manufacturing Extension

Partnership (MEP) (Mr. Ed Noha, Chair of the MEP National Advisory Board, reported the Board's views to the VCAT during the December 1999 meeting. Mr. Kevin Carr, MEP Director, presented a status report on MEP at the September VCAT meeting.)

• Program Highlights

The MEP network makes effective use of consultants and universities to deliver services to clients. Some centers have as much as 2/3 of the work done by third parties.

The Committee urged MEP to find

ways to quantify where a given firm is on the road to high performance.

Carr noted that most centers operate by providing an assessment of a company's health at no charge, but the company is usually expected to pay to get help with implementing a particular solution, such as reorganizing a plant to increase productivity. He noted that MEP is making more use of the Internet for training.

A recent survey in Connecticut indicated that only 10 % of small- and medium-sized businesses are up-to-speed on electronic commerce. Thus, the need to disseminate information on this topic to industry is comparable to the need to inform people about the Y2K problem several years ago.

Carr emphasized that integration is the key theme for 2001. We concurred that this is an appropriate area to emphasize.

• Issues and Challenges

The VCAT has been working to improve our communications with

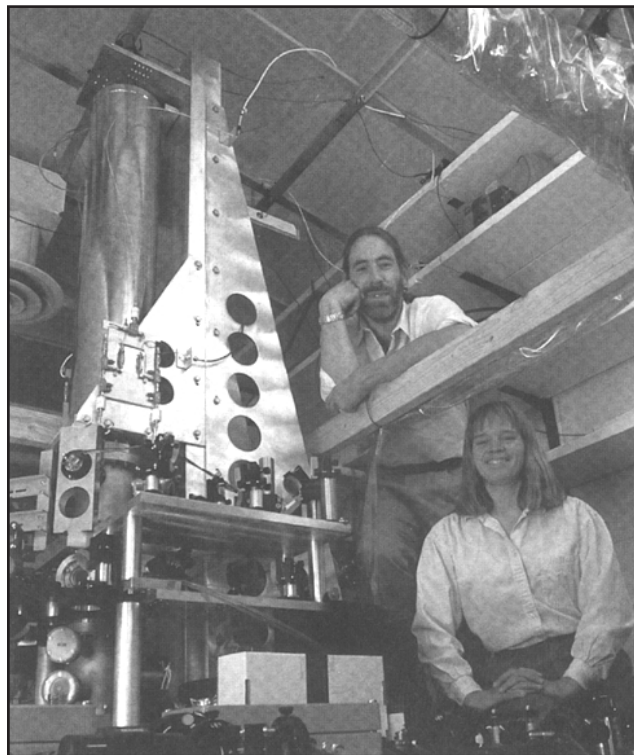


Photo: Geoffrey Wheeler

NIST's F-1 atomic clock, unveiled in 1999, is one of the most accurate in the world. The growing use of the global positioning system for a variety of civilian applications would not be possible without ultra-precise time standards. The VCAT has been briefed on how new developments in quantum mechanical phenomena can be exploited by NIST to continue to improve time standards.

In 1997 Dr. William Phillips won NIST's first Nobel Prize in Physics, demonstrating the high quality of the science done by NIST people. As NIST's first century of progress drew to a close, it is entirely appropriate that such a high honor should have come to NIST. The Committee fully expects the next century to bring still more kudos to this venerable institution.

the MEP and ATP Advisory Committees, and the National Research Council's Board on Assessment. We intend to have one of our members attend each future meeting of these bodies. While these other committees are concerned with somewhat different issues, there are also some common concerns, and we believe that improved coordination will be mutually beneficial. Inviting Mr. Ed Noha, Chair of the MEP National Advisory Board, to the December 1999 VCAT meeting to present a status report was a step in that direction. In his presentation Noha welcomed the opportunity to strengthen ties between the MEP Board and the VCAT. He made the following points:

- ◆ Current challenges to MEP include: 1) making the network of centers more self-sustaining, 2) publicizing the centers and achieving national recognition so as to make MEP a seamless national program, 3) bringing all centers up to the standards of the best centers, and 4) helping companies exploit e-commerce.
- ◆ It is important to consider options for the possible increased involvement of the private sector in the MEP in the future.
- ◆ Employee training is clearly essential to keep companies on the cutting edge of technology. An "integrated knowledge network" is a concept that is being explored in the MEP community for addressing the issue of how useful knowledge generated anywhere in the MEP system can be captured and shared. Training via the Internet is promising, but is still at an early stage.
- ◆ Another opportunity area is using the MEP centers to promote international trade. Many smaller U.S. companies are not knowledgeable about how to export, and MEP can help. (The Economic Strategy Institute's report, *Exports by Small Business: Performance Issues and Policy Options*, by Andrew Szamosszegi, calls attention to the opportunities for

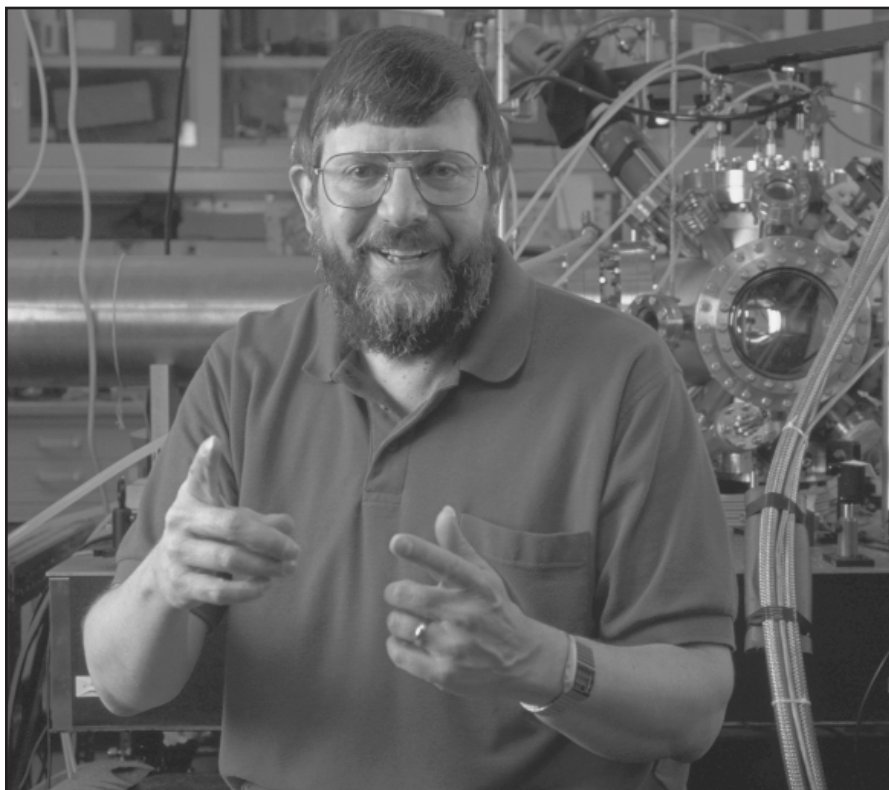


Photo: Robert Rathe

small business to increase exports.) Still another opportunity is for MEP centers to do matchmaking between companies that need funding and banks and venture capitalists seeking good investments.

Noha believes that having NIST as the central point of contact provides stability in the national system. Most centers get roughly a third of their support from NIST. Because that support is a minority share of the total funding, NIST cannot dictate to the centers how to operate. Nevertheless, NIST provides consulting on good practices and standards of operation. NIST can also review center operations, observe weaknesses, and coach them on how to improve.

The VCAT feels that the most challenging issue for MEP is how the network of independent centers can achieve increased synergy and how the small MEP staff at NIST can find ways to serve more companies without a proportionate increase in staff. The approach that MEP took to providing advice to companies on the Y2K problem (providing a standard package of materials) is a great success story that could serve as a model for addressing other needs.

L. Advanced Technology

Program (ATP) (Ms. Cita Furlani, Acting ATP Director, gave the presentation.)

• Mission and Industries Served:

ATP's mission is to accelerate the development of innovative technologies for broad national benefit through partnerships with the private sector.

Getting companies to collaborate on complex problems is difficult, and ATP can play a catalyst role. The Committee believes that this catalyst/convenor role is extremely important, perhaps as important as the funding itself, although without the "carrot" of the funding, companies are less likely to come together to explore collaboration. And, without focused programs, companies are less likely to have an excuse to come together to consider joint venture approaches to problem solving.

• Impact

As noted in Section II-G, in our opinion, the ATP is a well-managed program that is meeting a need and doing a thorough job of assessing and demonstrating its positive impact. The economic benefits from successful projects greatly exceed the cost of the program to date.

• Program Highlights

We were pleased to see that ATP is making more use of Web dissemination. The ATP proposal preparation kit, competition announcements, meeting announcements, databases of funded projects, press releases,

information on forming joint ventures, and ATP publications are all available on the ATP website. Having all ATP and Grants Office employees tied to a common internal database has helped with seamless tracking of projects.

• Issues and Challenges

There has been some criticism of ATP because companies in States such as California, Massachusetts, New York, and Texas have received so many awards, whereas some other States, particularly the more rural States, have not been well represented among the awardees. This is to be expected. Some States have more high-tech companies within their borders than others, and of course ATP is focused on high-tech companies. Location is not a factor in the ATP selection criteria. The geographic distribution of funds for NSF awards and for other agencies that fund technology closely parallel that of ATP, hence the distribution of ATP funding is just a reflection of the non-uniform geographic distribution of the science and technology base in the United States. ATP has been reaching out to under-represented States and to minority organizations to encourage their increased participation in the program.

The VCAT noted that ATP has funded many small start-up companies, some large firms, and a number of joint ventures, but disproportionately few medium-sized

companies. We asked ATP to think about why this might be so and whether more outreach to medium sized companies might be in order.

The discontinuance of focused program competitions was triggered by insufficient funds in recent years to support more than a couple of focused programs. Industry liked focused programs because they brought companies together to jointly identify common technical barriers, and because applicants felt that the selection boards for focused programs were better able to understand their proposals than general competition boards. The ATP Advisory Committee has asked ATP to reconsider whether focused programs might be resurrected and the pros and cons of doing so, and ATP is exploring this. We see this as an important issue.

We encouraged ATP to explore new alternatives for future competitions. For example, instead of having focused competitions in particular areas of technology, might it make sense for ATP to

have a focused program restricted to proposals involving a particular kind of structure, e.g., vertical joint ventures including suppliers, manufacturers, users, and universities?

M. VCAT Member Presentations

At most VCAT meetings, one of our Committee members makes a presentation about a topic of general interest. The member talks presented during the past year are listed below. The meeting minutes available on the VCAT website include descriptions of each presentation.

- *The Future of e-Business*, Dr. Caroline Kovac (Dec. 1999 Meeting)
- *The Science and Technology Investment Strategy at HRL Laboratories* - Dr. Conilee Kirkpatrick (March 1999 meeting)
- *Innovation and Competition in the Communication/Information Industry* - Dr. James Mitchell, (June 2000 meeting)

